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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/846,173	04/30/2001	Shih-Yen Lin	AB-1133 US	4181

7590 07/08/2003

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[REDACTED] EXAMINER

BEREZNY, NEAL

ART UNIT	PAPER NUMBER
	2823

DATE MAILED: 07/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)
	09/846,173	LIN ET AL.
	Examiner Neal Berezny	Art Unit 2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 16 April 2003.
- 2a) This action is FINAL.      2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 16-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 16-28 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 30 April 2001 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) The proposed drawing correction filed on \_\_\_\_\_ is: a) approved b) disapproved by the Examiner.  
 If approved, corrected drawings are required in reply to this Office action.
- 12) The oath or declaration is objected to by the Examiner.

#### Priority under 35 U.S.C. §§ 119 and 120

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All b) Some \* c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
  - a) The translation of the foreign language provisional application has been received.
- 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

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The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 21 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 21 specifies that the aluminum content range from 10% to 100%, but if  $x=1.0$ , then the material becomes AlAs, which is not 100% aluminum. It is unclear how one is to achieve 100% aluminum with the given chemical formula.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 16-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fafard et al. (6,239,449) in combination with Imamura et al. (5,936,258) and Jewell et al. (5,960,018). Fafard teaches building a quantum dot infrared photodetector structure comprising a gallium arsenide substrate, fig.1, el.2, a first gallium arsenide layer as a

first buffer layer, el.4, a first aluminum gallium arsenide layer as a blocking layer, el.12, a quantum dot structure layer, el.14, a second aluminum gallium arsenide layer as a second buffer layer, el.18, a second gallium arsenide layer as a contact layer, el.30; see also col.5, ln.1-9, wherein said first gallium arsenide layer and said second gallium arsenide layer are n-type gallium arsenide layers, col.5, ln.65-66, wherein the aluminum content of the first and second aluminum gallium arsenide layer range from 10% to 100% by weight, col.6, ln.3-19. Fafard also teaches forming a quantum dot infrared detector wherein said quantum dot structure layer comprises indium arsenide quantum dots and wherein said quantum dot structure layer is made of one of silicon/silicon germanium composite indium gallium arsenide barrier layer, col.5, ln.1-9, col.2, ln.65 to col.3, ln.13. Further, Fafard teaches a structure wherein the number of said multiple layers is ranged from 3 to 100, col.8, ln.59-69.

5. Fafard appears not to specifically state that the quantum dot structure is formed by multiple layers under an arsenic deficient condition, nor buried in an undoped gallium arsenide barrier layer, nor wherein the first and second aluminum gallium arsenide blocking layers are undoped, nor wherein the first gallium arsenide layer has a thickness of about 1 micron.

6. Imamura teaches a quantum dot structure formed by multiple layers, fig.31a, el.107, 108, 109d, 110, buried in an undoped gallium arsenide barrier layer, el.106, 111, and wherein the first and second aluminum gallium arsenide blocking layers are

undoped, col.23, ln.39-48, and wherein the first gallium arsenide layer has a thickness of about 0.2 micron, col.23, ln.16-17. Jewell teaches forming a superlattice quantum dot structure having multiple layers of InGaAs/GaAs, fig.8, el.58.

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7. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine Jewell with Fafard to use a superlattice structure instead of a single or multiple layer structure as the quantum well layer so as to reduce the peak transition energies of the heterostructure thus increasing the quantum efficiency and performance of the detector. Further, It would have been obvious to one of ordinary skill in the art at the time of the invention to combine Imamura with Fafard to bury the quantum well structure in an undoped gallium arsenide barrier layer, and form the first and second aluminum gallium arsenide blocking layers as undoped layers. Farad teaches that doping the barrier layer is optional, col.5, ln.1-21, and if doped will provide a source of carriers and can be adjusted to optimize the number of carriers and to engineer the built-in field after the charge transfer. Given the teachings of Farad, one would be motivated to combine Imamura with Farad to build a detector with undoped barrier layers to minimize charge generation in applications where the EM radiation levels have high intensity spikes and it would be desirable to reduce carrier generation so as not to overload the circuits and damage them. In addition, it would have been obvious to one of ordinary skill in the art at the time of the invention to use undoped GaAs as a barrier layer in the quantum dot structure because undoped GaAs is well

known to be an effective barrier material and would act as a functionally equivalent material, see col.5, ln.38-47.

8. Further, it would have been obvious to one of ordinary skill in the art at the time of the invention to form the InAs quantum dots under an As deficient condition so as to stress the active semiconductor layer lattice structure, which is well known to facilitate the generation of electron-hole pairs, thereby performing the functional equivalence of doping the semiconductor. Finally, It would have been obvious to one of ordinary skill in the art at the time of the invention to use a buffer layer of about 1 micron to provide an effective buffer between the substrate and the blocking layer. It is well known in the art to vary geometries and it has been found that unless applicant can demonstrate the critical nature of a dimension, it would be well within the skill of an ordinary artisan to vary dimensions.

#### ***Response to Arguments***

9. Applicant's arguments with respect to claims 16-17 and 21 have been considered but are moot in view of the new ground(s) of rejection. Although, some of applicant's comments may seem to still be relevant to the new rejections and examiner will respond to such arguments. Applicant's attention is directed to Fafard, col.5, ln.4-6, where Fafard states that the layer "can" be doped, thus providing some anticipation that it can also be undoped. Doping the layer is merely a preferred embodiment, see also col.6, ln.28-41.

## CONCLUSION

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). ~~Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).~~

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Neal Berezny whose telephone number is (703) 305-1481. The examiner can normally be reached on M-F 9:00 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7724 for regular communications and (703) 308-7724 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

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NB  
June 17, 2003



CK Chau-Chun  
Supervisory Patent Examiner  
Technology Center 2800